



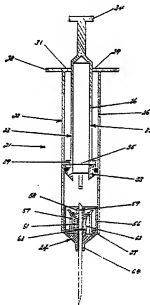
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : A61M 5/50, 5/34		(11) International Publication Number: WO 93/12830
A1		(43) International Publication Date: 8 July 1993 (08.07.93)
(21) International Application Number: PCT/AU93/00001		(74) Agent: KELSON, Robert, Charles; Callinan Lawrie, 278 High Street, Kew, VIC 3101 (AU).
(22) International Filing Date: 4 January 1993 (04.01.93)		
(30) Priority data: PL 0251 3 January 1992 (03.01.92) AU		
(71) Applicant (for all designated States except US): LOK-NEEDLE SYRINGE COMPANY PTY. LTD. [AU/AU]; 390-392 Bay Street, Port Melbourne, VIC 3207 (AU).		
(72) Inventors; and (75) Inventors/Applicants (for US only): REDFERN, Robert, Roy [AU/AU]; REDFERN, Elaine, Frances [AU/AU]; VAN NOORDEN, Jon, James [AU/AU]; VAN NOORDEN, Fleur, Denise [AU/AU]; 90 Carrington Road, Box Hill, VIC 3128 (AU).		
(81) Designated States: AT, AU, BB, BG, BR, CA, CH, DE, DE (Utility model), DK, DK (Utility model), ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG).		
Published With international search report.		

(54) Title: HYPODERMIC SYRINGE WITH RETRACTABLE NEEDLE

(57) Abstract

A hypodermic syringe (21) comprising a hollow needle (59) carried in a mount (58), a barrel (22) for containing medicament, a piston means (23) axially movable within barrel (22), the needle (59) and mount (58) being biased by spring (62) to move from a first position in which needle (59) extends from a first end (27) of barrel (22) of syringe (21) to a second position in which needle (59) is retracted into a tubular portion (36) provided in the body (32) of piston means (23), and further comprising a retainer (57) forming latch means operative normally to prevent such movement of needle (59) and mount (58) but releasable to allow such movement, the latch means being released when piston means (23) is moved to approach first end (27), and further comprising capture means in housing (56) to restrict piston means (23) against retraction towards the other end (31) of barrel (22) after piston means (23) has been moved to adjacent first end (27).



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FR	France	MR	Mauritania
AU	Australia	GA	Gabon	MW	Malawi
BS	Bahamas	GB	United Kingdom	NL	Netherlands
BE	Belgium	GN	Guinea	NO	Norway
BF	Burkina Faso	GR	Greece	NE	New Zealand
BG	Bulgaria	HU	Hungary	PL	Poland
BJ	Benin	IE	Ireland	PT	Portugal
BR	Brazil	IT	Italy	RO	Romania
CA	Canada	JP	Japan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SK	Slovak Republic
CJ	Côte d'Ivoire	LJ	Liechtenstein	SN	Senegal
CN	Comoros	LK	Sri Lanka	SU	Soviet Union
CS	Czechoslovakia	LJ	Luxembourg	TD	Chad
CZ	Czech Republic	MC	Monaco	TG	Togo
DE	Germany	MG	Madagascar	UA	Ukraine
DK	Denmark	ML	Mali	US	United States of America
ES	Spain	MN	Mongolia	VN	Viet Nam
FI	Finland				

- 1 -

HYPODERMIC SYRINGE WITH RETRACTABLE NEEDLE

Background of the Invention

This invention relates to a hypodermic syringe and more particularly to a hypodermic syringe incorporating means for retracting a needle within the syringe.

There is presently considerable concern within the medical profession and within the general public relating to injury or infection caused by accidental stabbing of a person by a needle of a hypodermic syringe. Such injury or infection is commonly referred to as "needle-stick injury". This type of injury arises because hypodermic syringes currently in use have needles which are exposed before and after use of the hypodermic syringe. While capping or shielding of needles is employed, needle-stick injuries can occur during recapping or reshielding after the syringe has been used. Further, if a used syringe is reused there is a danger of infection.

Background Art

A number of solution to the problem of exposed needles on used syringes have been proposed.

For instance, Australian Patent Application No. 628814 discloses a hypodermic syringe having a retractable needle carried in a needle support mounted on the end of the syringe body, the needle being attached to a needle holder which has a conical head on the end distant from the needle. A passage in the needle holder enables the needle bore to communicate with the chamber of the syringe through holes in the needle holder. The piston has a sealing cap engaged therewith and also a forwardly extending tubular portion defining an opening with a tapered wall which engages over the conical head on the needle holder to lock the head behind an

- 2 -

abutment surface. At the same time a diaphragm formed by the sealing cap extending across the tubular portion of the piston is ruptured so that the chamber of the syringe is no longer sealingly enclosed. Withdrawal of the piston and associated plunger draws the needle into the chamber. The needle can then be received into a housing within the body of the plunger.

This was perceived as addressing or overcoming disadvantages seen in the complexity of arrangements such as those disclosed in United States Patent Nos. 4,779,655, 4,710,170, 4,675,005, 4,650,468, 4,592,744 and 4,507,117.

However, the invention of Australian Patent No. 628814 requires that the piston means be moved away from the closed end of the body of the syringe to draw the needle into the chamber of the syringe. During this manoeuvre the potential for needle-stick injury is still present. Further, additional movements are required to effect receipt of the needle into the housing provided in the body of the plunger of the piston.

Summary of the Invention

The present invention seeks to provide a hypodermic syringe which will be useful in reducing needle-stick injury.

The present invention also seeks to provide a hypodermic syringe which, after use, cannot be reused.

Other objects, advantages or features of the present invention are set forth in the following description or will become apparent by practice of the present invention.

The present invention provides a hypodermic syringe comprising a hollow needle, a barrel for containing medicament or other liquid, and a piston means axially movable within the barrel, wherein the needle is biased to move from a first position in which

- 3 -

it extends from a first end of the barrel to a second position in which it is retracted into the barrel, and further comprising latch means operative normally to prevent such movement but releasable to allow such movement, said latch means being causable to be released when the piston means is moved within the barrel to approach the first end of the barrel.

Preferably the bias is provided by a spring.

Preferably the piston means engages with the latch means as it approaches the first end of the barrel to release the latch means to allow the needle to move under said bias from the first position to the second position.

Preferably capture means is provided to restrict the piston means or a part thereof against retraction towards the other end of the barrel after the piston means has been moved to adjacent the first end of the barrel.

Preferably the piston means comprises a body and a head.

Preferably the capture means is operative to capture the head.

Preferably the body is releasably connected to the head.

Preferably the piston means has a hollow chamber and in the second position the needle is located within the hollow chamber.

That hollow chamber may be defined by a tubular member connected to the head.

Preferably the hollow chamber is closed by a frangible diaphragm which the needle can pass through in moving from the first to the second position.

The frangible diaphragm may be located between the body and the head.

Preferably the hollow chamber contains a disinfectant.

- 4 -

Preferably said other end of the barrel has a finger grip with an aperture for the piston means.

5 Preferably the head of the piston means is of a size greater than said aperture so as to restrict against removal of the piston means.

 Preferably the piston means is associated with the barrel in a manner that requires tracing a complex path to move the piston means towards said other end of the barrel for the purpose of filling the syringe.

10 Preferably that complex path comprises translational and rotational movement.

 Preferably that complex path comprises a first translational movement, a rotational movement and a second translational movement.

15 Preferably means is provided to restrict the piston means against retracing of that complex path.

 Preferably the needle in the first position extends through a bore in the first end of the barrel.

20 Preferably means is provided to effect a seal between the needle and the bore. That means is preferably an annular seal. Bias means is preferably provided to act on that seal. That bias means may be a spring or a tubular resilient material.

 Preferably the first latch means is integrally formed with the barrel.

25 Preferably there is a single spring biasing into engagement with the latch means and also biasing to move from the first position to the second position.

 Preferably the first latch means comprises lugs on arms extending within the barrel and engaging with a mount for the

- 5 -

needle. Preferably that mount can move the lugs aside during assembly. In this last respect the lugs and the mount may rampingly engage during assembly.

5 The syringe of this invention may be readily modified to suit blood sample collection and intravenous supply or collection of blood.

Needle caps may be provided to facilitate various modes of filling.

10 Hypodermic syringes according to the invention may be constructed from currently known and used materials.

In order that the invention may be more clearly understood specific constructions of hypodermic syringes in accordance with this invention will now be described by way of non-limiting examples with reference to the accompanying drawings in which:-

15 FIG. 1 is a longitudinal sectional view of a hypodermic syringe according to the invention;

FIG. 2 is a detailed longitudinal sectional view of the needle assembly of the hypodermic syringe shown in FIG. 1;

20 FIG. 3 is a perspective view of a retainer forming latch means;

FIG. 4 is a perspective view of a mount for a needle;

FIG. 5 is a perspective view of a needle as may be used in the hypodermic syringe;

FIG. 6 is a perspective view of a first spring;

25 FIG. 7 is a perspective view of a second spring;

FIG. 8 is a perspective view of a seal for the needle and bore in the needle assembly of FIG. 2;

FIG. 9 is a partly sectional view of a housing;

FIG. 10 is a perspective view of a cap for a needle;

- 6 -

FIG. 11 is an exploded perspective view of a piston means for the hypodermic syringe;

FIG. 12 is a longitudinal sectional exploded view of part of the piston means of FIG. 11;

5 FIG. 13 is a fragmentary view of a barrel of the hypodermic syringe;

FIG. 14 is an exploded and partly longitudinal sectional view of part of the hypodermic syringe showing the relationship between the lower end of the piston means and the housing;

10 FIG. 15 is an elevation view of the hypodermic syringe of FIG. 1 and indicates movements of the piston means which are performed in use;

FIG. 16 is a fragmentary partly longitudinal sectional view of part of the hypodermic syringe of FIG. 1 and shows movements of the piston means which are performed in use;

15 FIG. 17 is a perspective view of a first modification of a needle cap and of part of a needle assembly;

FIG. 18 is a longitudinal sectional view of a first modified housing;

20 FIG. 19 is a cut-away perspective view of the first modified housing of FIG. 18;

FIG. 20 is a longitudinal sectional view of a first modified mount for a needle;

25 FIG. 21 is a longitudinal sectional view of a modified syringe end and a needle;

FIG. 22 is a perspective view of a modified head of a piston means for a hypodermic syringe according to the invention;

FIG. 23 is a longitudinal sectional view of the modified head of FIG. 23 mounted on a plunger;

- 7 -

FIG. 24 is a longitudinal sectional view of a second modified housing and of a second modified needle cap;

FIG. 25 is a perspective view of a second modified mount for a needle;

5 FIG. 26 is a longitudinal sectional view of a third modified housing, a modified piston means and a second modified needle cap;

FIG. 27 is a perspective view of a third modified mount for a needle;

FIG. 28 is a perspective view of a second modified head;

10 FIG. 29 is a fragmentary perspective view of part of the third modified housing of FIG. 26;

FIG. 30 is a fragmented longitudinal sectional view of a hypodermic syringe according to the invention showing certain modifications having the purpose of rendering the syringe suitable
15 for taking various blood samples;

FIG. 31 is a perspective view of a fourth modified mount for a needle;

FIG. 32 is a view of a vacuum tube;

20 FIG. 33 is a longitudinal sectional view of a cap assembly for the vacuum tube of FIG. 32;

FIGS. 34-36 are partial longitudinal sections of a modified needle cap showing a manner of use thereof;

FIG. 37 is a partial longitudinal sectional view of a modified barrel of a hypodermic syringe according to the invention;

25 FIG. 38 shows a cap for the modified barrel of FIG. 37;

FIG. 39 is a fragmentary perspective view of part of the modified barrel of FIG. 37; and

FIGS. 40-42 are partial longitudinal sectional views of another modified needle cap showing a manner of use thereof.

- 8 -

The syringe 21 shown generally in the drawings comprises a barrel 22, piston means 23 and a needle assembly 24.

5 The barrel 22 comprises a cylindrical portion 26, an open first end 27 sized to receive needle assembly 24, a finger grip 28 and an opening 29 in the other end 31.

The piston means 23 comprises a body 32, a head 33 and a seal 35.

10 The opening 29 is of a size such that the head 33 of the piston means may not readily pass therethrough.

The body 32 comprises an end 34 which can be pulled on by the fingers of a user to partly retract the piston means 23 from the barrel 22, a tubular portion 36 which may contain a sachet of a disinfectant (not shown here), an open end 38 which has an outwardly projecting flange 39 and a land 41 of generally circular cross-section on the flange 39.

15 The head 33 comprises a disc 42 having a first annular groove 43 of generally circular cross-section on that face of the disc proximate to flange 39, a second annular groove 44 of generally semi-circular cross-section on the circumference of the disc 42, a through bore 46, two semi-conic projections 47 and two legs 48 provided with feet 49 projecting from the face of the disc remote from flange 39.

The seal 35 comprises a frangible diaphragm 51 and an O-ring 52 which are formed integrally together.

25 As is shown in FIGS. 11, 12 and 1, the diaphragm 51 extends across the open end 38 and bore 46 and is captured by the location of the land 41 in the groove 43 and the O-ring 52 is located in the groove 44.

The seal 35, head 33 and the flange 39 together co-operate to act as a piston with the O-ring 52 acting as a vacuum sustaining

- 9 -

seal. Further, these components also co-operate to close the end 38 of the tubular portion 36.

The needle assembly 24 comprises the parts as shown in FIGS. 3-9 being the housing 56, retainer 57, mount 58, needle 59, springs 61 and 62 and seal 63.

The housing 56 as shown in FIG. 9 comprises an end 66 terminating in a spigot 64 and having a bore 67 through spigot 64, a skirt 68, an annular groove 69 surrounding a boss 65, slots 71 and 72 communicating with the groove 69, slots 73 and 74 communicating with an aperture 76 in the skirt 68, a ramp portion 77 and a recess 79. Similar slots to slots 71 and 72 and 73 and 74, a similar aperture to aperture 76, a similar ramp portion to ramp portion 77 and a similar recess to recess 79 are located at diametrically opposite positions to those shown in FIG. 9 but are not pictorially represented in FIG. 9.

The retainer 57 is made of resilient material and has a circular portion 81, lugs 82, arms 83, lugs 84 and trigger portions 86.

The retainer 57 is positioned so that the circular portion 81 is located in the annular groove 69 with the lugs 82 having been entered into the slots 71 and rotated to enter the slots 72 to thereby secure the retainer 57 to the housing 56.

The stainless steel spring 62 is also located in the annular groove 69 and acts on the mount 58 to urge it into engagement with the lugs 84.

The mount 58 comprises tube 90 containing bore 87, "lower" end 94, flange 95 and has triangular fins 91, 92, 91A and 92A with spaces 93 between them.

The needle 59 is a tight fit in a bore 87 in the mount 58 and extends through the bore 67.

- 10 -

5 The annular seal 63 is located on the needle 59 and the stainless steel spring 61 acts between the mount 58 and the seal 63 to urge the seal 63 into a sealing relationship with the boss 65 of housing 56 around the needle 59 to guard against leakage through the bore 67.

The cap 88 is provided for the needle 59 and open end 89 is adapted to fit snugly over spigot 64.

The needle 59 is also pointed at its "inner" end 96.

10 A hypodermic syringe as described above may be assembled in the following manner:

Needle 59 is press-fitted into bore 87 of mount 58 until sharp end 96 protrudes fully out the "upper" end of the mount. Spring 61 is slid over the "lower" end of needle 59 until it contacts "lower" end 94 of mount 58. Seal 63 is then slid up the needle 59 to hold spring 61 in position. Larger spring 62 is then located around the outside diameter of "lower" end 94 of mount 58. The lower end of needle 59 is then inserted into bore 67 of housing 56 so that the "lower" end of larger spring 62 is located around boss 65. The needle is then pulled in the direction outward of the housing 56 so that springs 61 and 62 are compressed. Retainer 57 is then located in annular groove 69. Needle 59 is then released so that springs 61 and 62 can pull the needle back into the housing 56 until lugs 84 on the tops of the retainer arms 83 engage the "top" face of flange 95 of mount 58. Needle cap 88 is then fitted over needle 59 engaging spigot 64.

The piston means 23 is assembled in a separate sub-assembly procedure. Seal 35 is located on the "top" face of the head 33 with the O ring 52 being located in second annular groove 44 so that frangible diaphragm 51 occludes bore 46. The body 32, which

- 11 -

may contain a sachet of disinfectant within tubular portion 36, is then press-fitted into position with land 41 being located in first annular groove 43, thus trapping frangible diaphragm 51 in position.

5 The "lower end" of piston means 23 is then positioned in housing 56, first locating feet 49 into the apertures 76, then rotating the piston means through an angle of 90 degrees so that feet 49 follow slots 74 until feet 49 are aligned with slots 73. Finally, the piston means is "lowered" until feet 49 rest on the "bottom" of slots 73. Barrel 22 is then lowered over the piston means-needle assembly 10 and press-fitted over the skirt 68 of the housing 56 in a sealing relationship. End 34 may then be fixed to or moulded from the body 32 of the piston means 23. Alternatively, the finger grip 28 and opening 29 at the "upper" end of barrel 22 may be then formed by moulding.

15 The assembled syringes are then sterilised in ethylene gas or by gamma radiation. The above exemplary assembly process can be automated.

 The manner of use of the hypodermic syringe will now be described.

20 As supplied to a user, the piston means 23 will be located further into the barrel than is depicted in FIG. 1 and reference is made to FIGS. 14-16. As supplied, the feet 49 are located at the bottom of slots 73 and the semi-conic projections 47 are in a rotated position such as not to be in engagement with the trigger portions 25 86 but to be located between the arms 83.

 To fill the syringe the needle 59 is inserted into the appropriate liquid, which may be a medicament, and the piston means 23 is moved as shown particularly in FIG. 16 upwardly in movement 1, part rotary in movement 2 and upwardly in movement

- 12 -

3. The feet 49 thus follow the slots 73 and 74. It is to be noted that there step 97 is present to restrict the feet 49 against reverse movement. During movement 1 liquid is taken into the syringe and this liquid forms part of the dosage. During movement 2 no liquid is taken into the syringe. However, as a result of this movement, semi-conical projections 47 become aligned with trigger portions 86. During movement 3 more liquid is taken into the syringe until the required volume of liquid has been taken into the syringe.

When the syringe is filled with the desired volume of liquid, a patient may be injected by pressing on the end 34 of body 32 so that the piston means moves in movement 4 in FIG. 16. The feet 49 are guided by the edges of the aperture 76 onto the ramp surfaces 77; continued downward movement on the plunger 23 will result in the projections 47, which, as aforesaid, are aligned with the trigger portions 86, coming into contact with those trigger portions when the plunger reaches the scale "0" mark (Fig. 15). The trigger portions 86 will then be moved outwardly as will also the arms 83 and lugs 84. As a result, the lugs 84 no longer engage with the mount 58 and the spring 62 will urge the mount 58 and needle 59 outwards from the patient's body and towards the diaphragm 51 and sachet (if present) which the "inner" end 96 will penetrate to enable the needle 59 become received into the tubular portion 36 and, optionally, to activate a sterilisation process.

The needle 59 will thus become enclosed and there will be reduced risk of needle-stick injury. The needle cap 88 can then be replaced on spigot 64 to prevent effluxion of liquid from the syringe.

Further, the feet 49 pass off the ramp surfaces 77 into the recesses 79 to restrict against retraction of the plunger.

Any attempt to forcibly return the piston means 23 to its

- 13 -

upward position will result in a further internal destruction whereby body 32 will separate from disc 35 and head 33 at annular groove 43 and land 41. Under this condition the body 32 of the piston means will remain entrapped within the barrel 22.

5 In the modification shown in FIG. 17 the end 66 has a spigot 101 formed of a number of conic portions and the needle cap 102 is engageable on the spigot 101. During manufacture the needle cap is pushed over the outer conic portion only of the spigot. This provides safety during the remainder of the manufacturing process and during distribution. At the point of use the operator can readily remove the needle cap. The needle cap 102 when refitted after
10 needle 59 has been received into tubular portion 36 can be pushed firmly over both conic portions of spigot 101 and will form an airtight seal, which will be very difficult to remove, thus allowing any
15 disinfectant present to flow through the hole 67 filling cap 102 and cleansing exterior portions of spigot 101 without escaping from the capped syringe.

Disinfectants such as those sold under the trade marks Aldercide or Wavecide may be used in the postulated sachet to
20 destroy germs and viruses that may be contained in the used syringe.

The used syringe can then be disposed of as a fully sealed, sterile unit.

In various modifications of the above described hereinafter,
25 where integers or means are the same as previously or work substantially the same as previously like reference numerals generally will be used.

FIGS. 18 to 21 show a number of modifications which are advantageous.

- 14 -

5 The housing 156 shown in FIG. 18 is like housing 56 but the retainer 57 has been incorporated into it so that arms 82, lugs 84 and trigger portions 86 are all integral with the housing 156. As a result, circular portion 81, lugs 82, groove 69, slots 71 and 72 and spring 62 are omitted. A new groove 169 is provided for spring 61 and a boss 120 aids location. The depth of slot 174 has been modified from full depth at its junction with slot 73 to zero depth at its junction with ramp portion 77.

10 The modified mount 158 shown in FIG. 20 differs from the mount 58 of FIG. 4 in that it is tapered to the needle diameter at 125, has a concertina spring ending 135 to effect a seal with seal 163 and boss 120 and is tapered at 130 and 140 and has a bore 137 to receive needle 59 in a tight fit.

15 The modified housing 156 terminates at its outer end in a tapered hub 143 provided with an annular groove 144 to engage a needle cap. Large bore 145 can act as a shield or "splash guard" in case any drops of liquid remain on a needle end after use.

The taper at 130 helps to move lugs 84 aside in assembly and they will spring back to engage taper 140.

20 The modifications described above lead to elimination of a number of separate components, allow the overall length of the housing to be reduced, and simplify assembly operations by reducing the number of steps. The modification of slot 174 creates a more effective "stop" against feet 49 being forced back into slot 174 after the filling cycle has been commenced. Taper 140 creates greater
25 holding effect between retainer lugs 86 and mount 158 when under load. The taper at 125 assists in the perforation of frangible diaphragm 51 during needle retraction.

A syringe incorporating modifications as shown in FIGS. 22

- 15 -

to 25 may be used as a pre-filled single use syringe.

The head 133 shown in FIGS. 22 and 23 has a truncated conical lower end 134 and is not provided with legs and feet and is used with the glass housing 256 shown in FIG. 24 which has slots and ramp surface omitted.

The mount 258 shown in FIGS. 24 and 25 is made of glass and is used with housing 256. Mount 258 has slots 150 in flange 155 to permit passage of lugs 84 which are made of glass. Simple rotation of the mount 258 will cause the lugs 84 to locate on the "upper" surface of flange 155. The end 166 of housing 256 terminates in a spigot 201 adapted to receive a clip-on needle cap 103.

The various modifications shown in FIGS. 26 to 29 are used to make a retractable intravenous needle for use in blood transfusion or blood collection.

Those modifications include a piston means body 122 which has a hole 160 to allow plastic tubing 165 to pass. Mount 358 has a flange 170 top 170 conformed or moulded to accept and hold in a sealing relationship the tubing 165 as shown in FIG. 26. Bore 187 through mount 358 receives "inner" end 196 of needle 159 in a sealing relationship. Head 233 has lugs 175 for entering into tracking grooves 188, 189, 190 in housing 356 more specifically shown in FIG. 29. It is to be noted that body 122 and head 233 are formed as a single unit. The tracking groove 190 shown in FIG. 29 tapers to create a slight locking effect on the lugs 175 to avoid inadvertent retraction of the needle.

An input bag or outlet blood collector may be connected to the tubing 165.

The end 166A of housing 356 terminates in a spigot 201

- 16 -

adapted to receive a clip-on needle cap 103.

The modifications shown in FIGS. 30 to 33 are useable for a retractable venipuncture syringe.

5 Piston means 222 has a bore 195 to accept the neck 200 of a vacutainer 205.

Mount 458 has a double ended needle 210, the end 216 being for penetrating a seal 215 over the neck 200 of the vacutainer 205. A rubber sheath 220 is provided as is a cap 225 for the vacutainer 205. The housing 356 is as described above.

10 Various modifications of needle caps and a manner of use thereof are shown in FIGS. 34 to 36.

15 In FIG. 34 is shown a needle cap 202 having a single-stepped end 230 for fitting over a groove in a spigot or nozzle 235. At the other end is a seal cap 240 which can be broken off at a snap line 245. The seal cap has a taper conforming to the hub taper currently used on syringes.

20 After breaking off the seal cap 240, the end 250 may be entered into an ampoule 255 or the cap 202 can be removed to permit needle 236 to penetrate a diaphragm or a standard needle can be fitted to taper 260. Thereafter the seal cap 240 may be used to seal the syringe after use.

A side-fill syringe is shown in FIGS. 37 to 39.

25 The barrel 126 shown in Figs. 37 and 39 has a standard taper hub 265 moulded on the side below the zero line of the barrel with a bore 270 providing communication to the inside of the barrel.

The barrel 126 can be filled through the hub 265 and this will be found to be useful when viscous medicaments are to be used.

A closure or cap 275 is provided for closing the bore 270 after filling. That closure 275 has a plug 280 for the bore 270 and the

- 17 -

usual latch means 290 for engaging with lugs 295 on taper hub 265. Thereafter the syringe can be used in the manner of this invention.

A blood transfer syringe is shown in FIGS. 40 to 42.

5 In this case the syringe has a needle cap 302, somewhat similar to cap 202, which has seal cap 240, break line 245 but also grasp claws 305 mounted on tube 310. The needle cap 302 is made of ambient temperature memory plastic.

FIG. 41 shows how, after removal of seal cap 240 the tube 310 can be concertinaed until the claws 305 engage with groove 314
10 in the nozzle end 315 to expose needle 59 for use in being filled with blood or other fluid.

If the arms 320 of the claws 305 are squeezed the tube 310 will expand and the end 325 can be capped by the seal cap 240 as shown in FIG. 42.

15 The closure 275 can be removed and the contents of the syringe can be exhausted into a sample container and on completion of the exhaust stroke the needle will be caused to retract.

Various of the above modifications reduce the number of the parts and or simplify assembly or use or increase usefulness.

20 Finally, it is to be understood that the inventive concept in any of its aspects can be incorporated in many different constructions so that the generality of the preceding description is not to be superseded by the particularity of the attached drawings. Various alterations, modifications and or additions may be incorporated into
25 the various constructions and arrangements of parts without departing from the spirit and ambit of the invention.

CLAIMS

1. A hypodermic syringe comprising a hollow needle, a barrel for containing medicament or other fluid, a piston means axially movable within said barrel, wherein said needle is biased to move
5 from a first position in which it extends from a first end of said barrel to a second position in which it is retracted into said barrel, and further comprising latch means operative normally to prevent such movement but releasable to allow such movement, said latch means being causable to be released when said piston means is
10 moved within said barrel to approach said first end of said barrel.
2. A hypodermic syringe as claimed in Claim 1 wherein capture means is provided to restrict said piston means or a part thereof against retraction towards the other end of said barrel after said piston means has been moved to adjacent said first end of said
15 barrel.
3. A hypodermic syringe as claimed in Claim 2 wherein said piston means comprises a head and a body, said capture means being operative to capture said head.
4. A hypodermic syringe as claimed in any one of Claims 1 to
20 3 wherein said piston means is associated with said barrel in a manner that requires said piston means to trace a complex path in moving towards said other end of the barrel for the purpose of filling said hypodermic syringe.
5. A hypodermic syringe as claimed in Claim 4 wherein tracing
25 said complex path comprises translational and rotational movements.
6. A hypodermic syringe as claimed in Claim 5 wherein tracing said complex path comprises a first translational movement, a rotational movement and a second translational movement.
7. A hypodermic syringe as claimed in Claim 6 wherein means

- 19 -

is provided to restrict said piston means against retracing said complex path.

8. A hypodermic syringe as claimed in any preceding claim wherein said needle when in said first position extends through a bore in said first end of said barrel.

9. A hypodermic syringe as claimed in Claim 8 wherein means is provided to effect a seal between said needle and said bore.

10. A hypodermic syringe as claimed in Claim 9 wherein said seal is an annular seal and bias means is provided to act on said seal.

11. A hypodermic syringe as claimed in any preceding claim wherein said latch means comprises lugs on arms extending within said barrel and engaging with a mount for said needle.

12. A hypodermic syringe as claimed in Claim 11 wherein said mount is capable of moving said lugs aside during assembly of said hypodermic syringe.

13. A hypodermic syringe as claimed in either Claim 11 or Claim 12 wherein said lugs and said mount engage rampingly during assembly of said hypodermic syringe.

14. A hypodermic syringe as claimed in any preceding claim wherein said latch means is formed integrally with said barrel.

15. A hypodermic syringe as claimed in Claim 14 wherein there is provided a single spring biasing into engagement with said latch means and also biasing to move from said first position to said second position.

16. A hypodermic syringe as claimed in any preceding claim wherein said body is releasably connected to said head of said piston means.

17. A hypodermic syringe as claimed in any preceding claim wherein said piston means is provided with a hollow chamber and

- 20 -

in said second position said needle is located within said hollow chamber.

18. A hypodermic syringe as claimed in Claim 17 wherein said hollow chamber is defined by a tubular member connected to said head.

19. A hypodermic syringe as claimed in Claim 18 wherein said hollow chamber is closed by a frangible diaphragm through which said needle passes when moving from said first position to said second position.

20. A hypodermic syringe as claimed in Claim 19 wherein said frangible diaphragm is located between said body and said head.

21. A hypodermic syringe as claimed in Claim 20 wherein said hollow chamber contains a disinfectant.

22. A hypodermic syringe as claimed in any preceding claim wherein said other end of said barrel is provided with a finger grip and an aperture for said piston means.

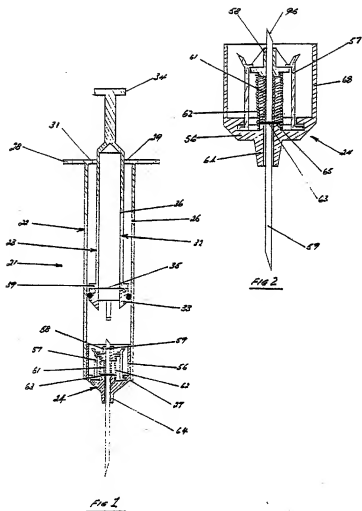
23. A hypodermic syringe as claimed in Claim 22 wherein said head of said piston means is of a size greater than said aperture so as to restrict against removal of said piston means.

24. A hypodermic syringe as claimed in any one of the preceding claims wherein said hypodermic syringe is further provided with means for effecting collection of a blood sample.

25. A hypodermic syringe as claimed in any one of Claims 1 to 23 where said hypodermic syringe is further provided with means for effecting intravenous supply or collection of blood.

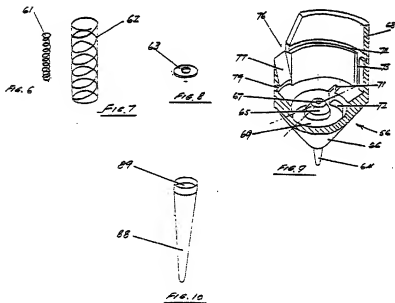
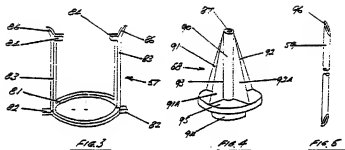
26. A hypodermic syringe as claimed in any one of the preceding claims substantially as hereinbefore described with reference to any one of FIGS. 1 to 42.

1/13



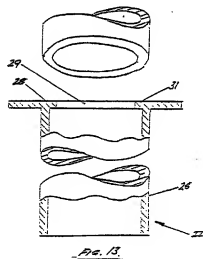
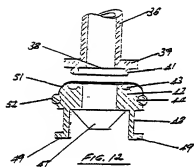
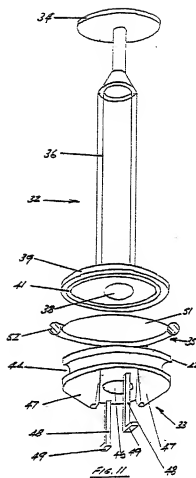
SUBSTITUTE SHEET

2/13

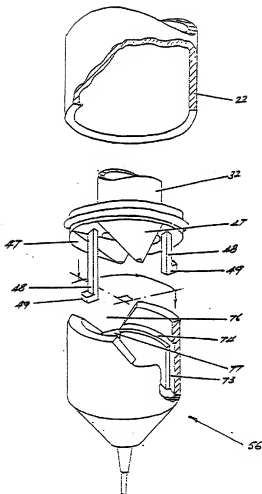


SUBSTITUTE SHEET

3/13

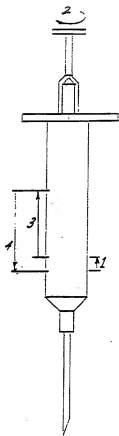
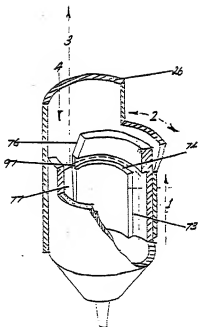


4/13

FIG. 1A

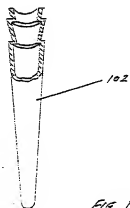
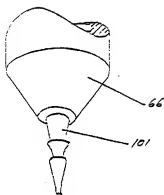
SUBSTITUTE SHEET

5/13

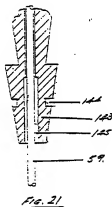
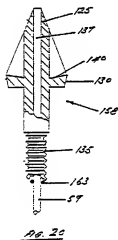
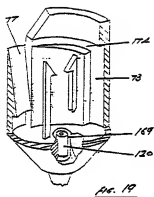
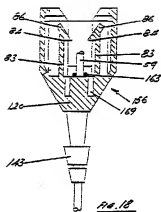
Fig. 15Fig. 16

SUBSTITUTE SHEET

6/13

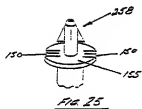
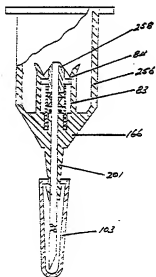
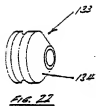
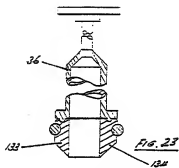
FIG. 17

7/13



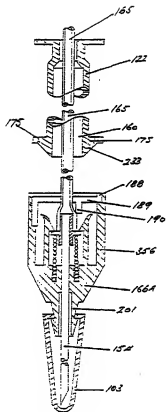
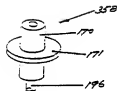
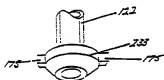
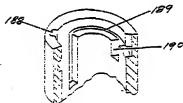
SUBSTITUTE SHEET

8/13



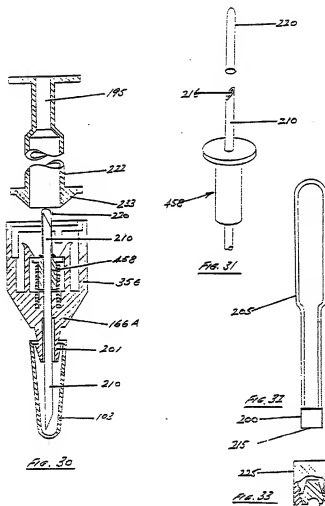
SUBSTITUTE SHEET

9/13

FIG. 26FIG. 27FIG. 28FIG. 29

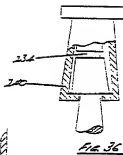
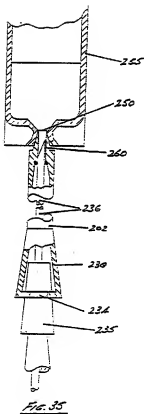
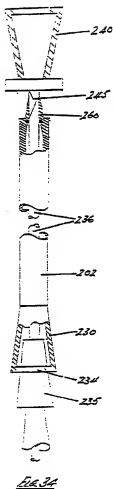
SUBSTITUTE SHEET

10/13



SUBSTITUTE SHEET

11/13



SUBSTITUTE SHEET

12/13

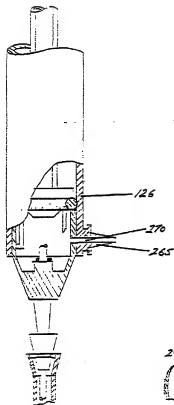


FIG. 37

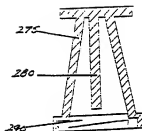


FIG. 38

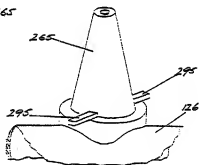
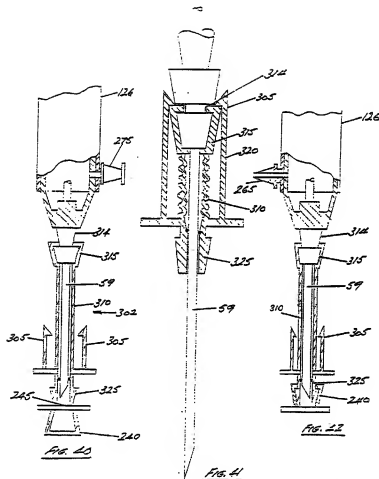


FIG. 39

13/13



SUBSTITUTE SHEET